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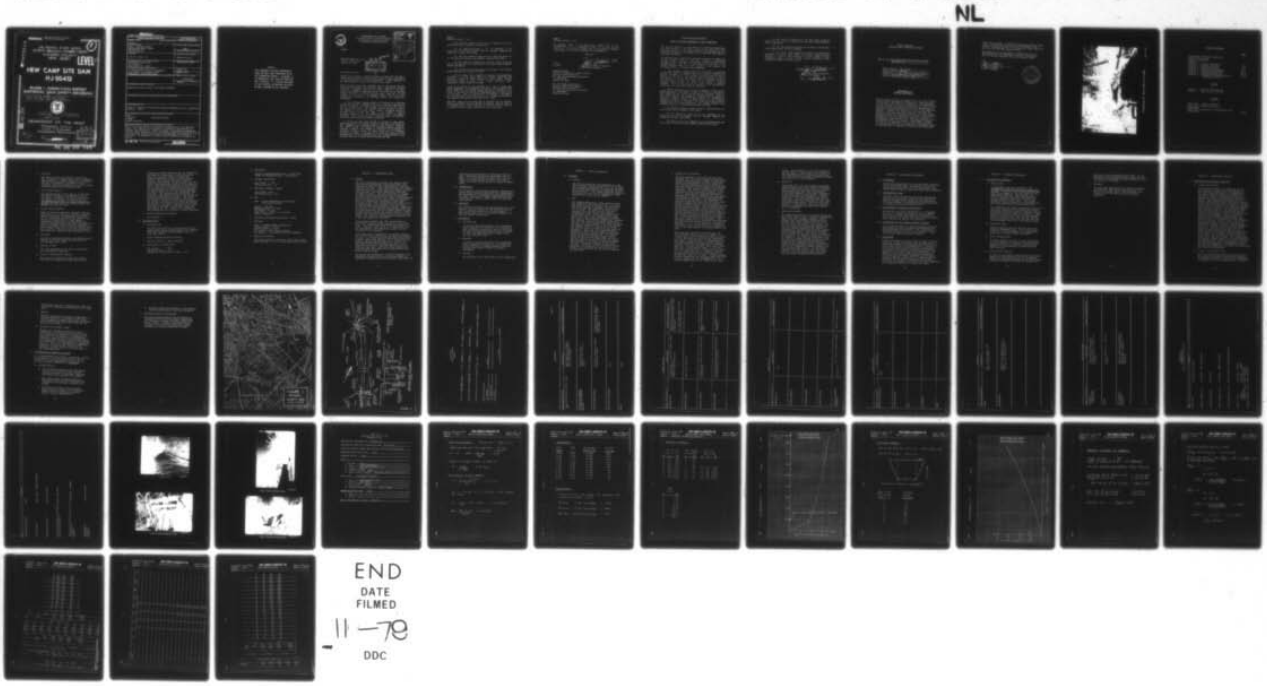

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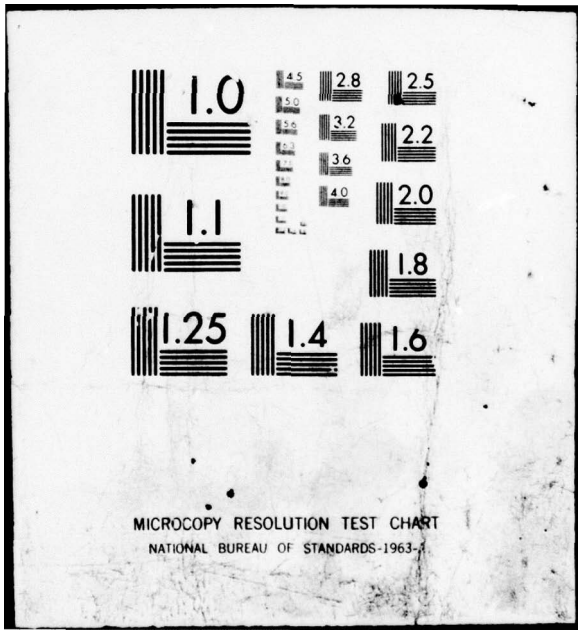
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NORTH BRANCH TIMBER CREEK,
CAMDEN COUNTY
NEW JERSEY

LEVEL II

NEW CAMP SITE DAM
NJ 00412

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

New Camp Site Dam (NJ-00412). Delaware River Basin. North Branch Timber Creek, Camden County, New Jersey. Phase 1 Inspection Report.

(9) Final rept.,

(10) F. Keith /Jolls

(15) DACW61-79-C-0011

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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7. AUTHOR(s) Jolls, F-. Keith P.E.		8. CONTRACT OR GRANT NUMBER(s) DACW61-79-C-0011 ✓
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11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, Pennsylvania 19106		12. REPORT DATE August, 1979 13. NUMBER OF PAGES 30
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Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams
Spillways
Slopes
Visual Inspection
Structural Analysis

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO

NAPEN-D

20 SEP 1979

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for New Camp Site Dam in Camden County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, New Camp Site Dam, a high hazard potential structure, is judged to be in fair overall condition. The dam's spillway is considered inadequate since 23 percent of the Spillway Design Flood--SDF - would overtop the dam. (The SDF, in this instance, is one half of the Probable Maximum Flood.) To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around the clock surveillance should be provided.

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to determine the dam's embankment and foundation condition and structural stability. This should include test borings to determine material properties relative to stability and seepage and installation of piezometers to facilitate seepage studies. A study should also be undertaken regarding the removal or blocking of the auxiliary spillway and the reconstruction of the downstream area. Any remedial measures found necessary should be initiated within calendar year 1980.

c. The following remedial actions should be completed within one year from the date of approval of this report:

(1) The downstream slopes of the dam embankment in the vicinity of the spillway wingwalls should be regraded, compacted and topped with suitable slope paving.

(2) The trees should be removed from the downsteam slopes and the disturbed and sloughed areas regraded, compacted and seeded.

(3) The under-cut leaning trees and dead timber along the edge of the lake should be removed and the shoreline protected against further undermining.

(4) The deteriorated deck plank and railings on the spillway bridge superstructure should be replaced.

(5) The owners should upgrade the operation and maintenance procedures by issuing check lists for periodic inspections and institute a system of record keeping for severe storms. Further instruction should be given to the in-house maintenance staff regarding the safety inspection of dams.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman James A. Florio of the First District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

NAPEN-D
Honorable Brendan T. Byrne

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

NEW CAMP SITE DAM (NJ00302)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 1 May 1979 by Louis Berger and Associates, Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

New Camp Site Dam, a high hazard potential structure, is judged to be in fair overall condition. The dam's spillway is considered inadequate since 23 percent of the Spillway Design Flood--SDF - would overtop the dam. (The SDF, in this instance, is one half of the Probable Maximum Flood.) To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around the clock surveillance should be provided.

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to determine the dam's embankment and foundation condition and structural stability. This should include test borings to determine material properties relative to stability and seepage and installation of piezometers to facilitate seepage studies. A study should also be undertaken regarding the removal or blocking of the auxiliary spillway and the reconstruction of the downstream area. Any remedial measures found necessary should be initiated within calendar year 1980.

c. The following remedial actions should be completed within one year from the date of approval of this report:

(1) The downstream slopes of the dam embankment in the vicinity of the spillway wingwalls should be regraded, compacted and topped with suitable slope paving.

(2) The trees should be removed from the downsteam slopes and the disturbed and sloughed areas regraded, compacted and seeded.

(3) The under-cut leaning trees and dead timber along the edge of the lake should be removed and the shoreline protected against further undermining.

(4) The deteriorated deck plank and railings on the spillway bridge superstructure should be replaced.

(5) The owners should upgrade the operation and maintenance procedures by issuing check lists for periodic inspections and institute a system of record keeping for severe storms. Further instruction should be given to the in-house maintenance staff regarding the safety inspection of dams.

APPROVED: for James G. Ton LTC
JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 19 September 1979

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam New Camp Site Dam Fed ID# NJ 00412
NJ ID# 31-41

State Located New Jersey
County Located Camden
Coordinates Lat. 3947.7 - Long. 7458.3
Stream North Branch Big Timber Creek
Date of Inspection May 1, 1979

ASSESSMENT OF GENERAL CONDITIONS

The New Camp Site Dam is judged to be in a fair overall condition but considerable seepage was observed below the spillway and along the backslopes. The embankment is over 70 years old and has withstood the test of time but additional engineering studies are recommended to assess the continued stability in view of the observed seepage. Further, the feasibility of removing the auxiliary spillway should be studied. No other detrimental findings were uncovered to render a questionable judgement as to the structural stability except the downstream splash apron at the auxiliary spillway is in an advanced stage of collapse. Recommended remedial actions to be undertaken in the near future include 1) regrade and protect the downstream embankment slopes at the spillway 2) remove the trees on the downstream

slopes and regrade, 3) remove the dead and leaning trees along the shoreline and protect the embankment from further undercutting and, 4) replace the timber deck and rails on the spillway superstructure.

The capacity of the spillway is unadequate as it is determined that the embankment could be overtopped for all storms exceeding 22% of the design flood.

F. Keith Jolls P. E.
Project Manager

OVERVIEW OF NEW CAMP SITE DAM

MAY , 1979

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FIGURES

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: NEW CAMP SITE DAM FED # NJ00412
AND NJ ID# 31-41

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The State, in turn, is under agreement with the U.S. Army Corps of Engineers, Philadelphia to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the New Camp Site Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The New Camp Site Dam is a 370 foot long earthen structure with a partial length timber sheeting cut-off wall. The principal discharge outlet is a 5-sided sharp-crested concrete weir under a wooden bridge 70 feet from the left abutment. The crest is at elevation 76.0. An auxiliary spillway is located next to the right abutment and consists of three 18" diameter terra cotta pipes which discharge onto a partially destroyed splash apron. The embankment has a maximum height of 12 feet to the crest elevation of 79.5 and has a narrow dirt road running along the entire crest length.

b. Location

New Camp Site Dam is located in Pine Hill, Berlin Township, Camden County and is situated approximately 1.3 miles southeast of Clementon. The dam is immediately southeast of the Clementon and Pilling Lakes and is built across the North Branch of Big Timber Creek.

c. Size Classification

The maximum height of the dam is 12 feet and the maximum storage is estimated to be 131 acre feet. Therefore, the dam is placed in the small size category as defined by the Recommended Guidelines for Safety Inspection of Dams (storage less than 1000 acre feet and height less than 40 feet)

d. Hazard Classification

Based on Corps of Engineers criteria and the fact that in the event of a failure, excessive damage could occur to downstream properties with a substantial potential for loss of life, the dam is classified as a high hazard. Immediately downstream, are two dams which could be breached should New Camp Site Dam fail. Below these dams lies the town of Clementon, which could suffer severe flooding should there be a failure. Further, there are two smaller dams above the study dam (see paragraph 3.1.d).

e. Ownership

The dam is presently owned by the Camden County Council of the Boy Scouts of America, West Collingswood, New Jersey.

f. Purpose of Dam

The lake impounded by the dam is used solely for recreational purposes.

g. Design & Construction History

The original installation date of a dam at this site is unknown but State Water Policy

Commission records indicate that an inspection was made of a structure in 1925 and before 1939, the original timber spillway had collapsed and been filled in with sand and gravel. The pond was originally called Ireland's Pond (after an early owner) and the rebuilt dam apparently suffered a collapse in 1940. Plans were developed in 1942 to rebuild the spillway and a reconstruction permit was filed approved, with the work being completed in 1946 by which time it was called New Camp Site Dam. The reconstruction consisted of building a new concrete spillway (as it exists today) and regrading the crest. The design was carried out by Mr. Furman W. Shaw and Mr. Eugene F. Verga was the general contractor. As the dam is situated in the Pine Hill Scout Reservation, the owners requested in 1974 that its name be changed to Lakau Lake under Dam Application No. 407. There is no record of any response by the Division of Water Resources.

h. Normal Operating Procedures

See Section 4

1.3 PERTINENT DATA

a. Drainage Area

New Camp Site Dam has a drainage area of 1.9 square miles which consists mainly of woodland with some residential development and a 36 hole golf course.

b. Total combined spillway capacity

885 cfs (825 cfs - main spillway)

c. Elevations (ft above MSL)

Top of dam - 79.5
Recreation pool - 76.0
Streambed at centerline of dam - 67.5

d. Reservoir

Length of maximum design pool - 4,100 feet
Length of recreation pool - 3,000 feet

e. Storage (acre-feet)

Top of dam - 131
Recreation pool - 74

f. Reservoir Surface (acres)

Top of dam - 29.2
Recreation pool - 12.3

g. Dam

Type - Earth embankment with weir and auxiliary spillway

Length - 370 feet
Maximum Height - 12 feet
Top Width - 10 feet
Side Slopes - Varies (2 to 1H:1V)
Zoning - Unknown

h. Diversion and Regulating Tunnel - None

i. Spillway

Type - 5 sided narrow crested weir
Channel Width - 20 feet
Crest Elevation - 76.0
U/S Channel - main lake reservoir
D/S Channel - ill-defined natural streambed

j. Regulating Outlets

Auxiliary spillway: three 18" terra cotta pipes
Main Spillway: 3' x 3' sluice gate (Inv. 67.5±)

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The only information available for design review were microfilm drawings of Dam Application 407 prepared in 1946 for the construction of the main concrete spillway. These also included the concrete intake for the 3-18" pipe auxiliary outlet and its ogee spillway (the pipes appeared to have been already in place). The main spillway is founded on timber piles and protected from undercutting by wood T.&G. sheeting on all sides. The reinforced concrete appears to have been carefully detailed and is of substantial thickness in all highly stressed zones. The interlocked steel sheet piling installed around each wingwall does not appear on the original Dam Application; however, according to records, it was installed immediately after the spillway completion and its primary purpose appears to have been to retain the earth slopes of a wider roadway and vehicular bridge which crosses the dam crest. The original plan appeared to contain only a narrower pedestrian crossing.

As previously stated, the 1946 reconstruction replaced an earlier timber spillway at this location. The trapezoidal embankment was already in place. However, some 550 c.y. of additional fill was compacted on the sideslopes, mainly in the vicinity of the spillway.

From Water Quality Commission inspection reports, the 11 foot long steel piling was driven to refusal in white, very fine sand and using the ENR driving formula, had a safe capacity of 11 tons while the maximum computed design load was 4.4 tons. No test boring data was available but this site is underlain with recent alluvium deposits of silt, sand and some clay. The underlying formation is Kirkwood sand and bedrock is in excess of 50 feet below original grade.

The design was prepared in a manner consonant with standard practices at that time and although no meaningful computations were available, the geometry

and details are depicted in sufficient detail so that a meaningful structural assessment can be made. It was noted that weepholes were not provided to relieve uplift but after over thirty years, the timber sheeting can no longer be watertight.

2.2 CONSTRUCTION

No information is available regarding construction except State Engineers monitored the installation and reported on its progress as being satisfactory. The steel sheeting and timber superstructure was installed only about 3 months after the spillway substructure.

2.3 OPERATION

The spillway operates as an uncontrolled weir (see Section 4) as the wheel for the low-level sluice gate is normally stored at the Camp Ranger's maintenance shop and is only used to dewater the lake for annual maintenance.

2.4 EVALUATION

a. Availability

In view of the dam assessment and recommendations contained in Section 7, it is believed that sufficient engineering data is available for the following assessment without recourse to obtaining additional design data or the original contract plans.

b. Adequacy

In view of the dam assessment and recommendations contained in Section 7, it is felt the field inspection provided adequate engineering data upon which to base a reliable assessment.

c. Validity

The validity of the 1946 plans is not challenged.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

The visual inspection was conducted on 1 May 1979 at which time the water level in the lake was producing a moderate flow over the spillway weir (which prevented close inspection of the spillway walls). The overall physical condition of the dam is fair but the embankment slopes appeared to be very poorly graded.

b. Dam

The roadway embankment, which forms the main dam structure, was assessed to be in a solid and stable condition although the slopes are heavily wooded and irregular, varying from 1:1 to 2H:1V. The crest of the dam is an irregular dirt access road that appears infrequently used. There are numerous fair sized trees (4" to 18") growing along each side of the crest and considerable siltation was noted in the reservoir immediately upstream from the dam. Many of the mature trees along the lake are tilted towards the reservoir which indicates an undercutting of the root systems. The roadway profile is fairly level across the dam but rises on either end just past the abutments. There was no riprap protection observed at this site and numerous backslope areas are deeply sloughed out. Two extensively large areas in the natural terrain below the toe of downstream slope were wet and this appears to be the result of seepage. Additionally, a wet area was observed below the left downstream wingwall at the main spillway. A portion of the discharge channel parallels the downstream toe of slope and could be obliterating any evidence of seepage in that zone.

c. Appurtenant Structures

The main spillway is located near the left abutment and is a rather unique 5-sided sharp-crested weir which has an effective hydraulic length of approximately 42 feet. There are two interior transverse walls paralleling the exterior abutments which support the seventeen foot span steel I-beam and timber deck superstructure. The deck is rotted and is in poor condition but the supporting concrete piers are in a satisfactory condition and show no evidence of tilting or differential settlement. A dilapidated wood railing is erected along each fascia of the deck. The embankment is severely eroded along each of the flared downstream wingwalls but the steepened slopes appear to have reached a fairly stable condition at approximately 1H:1V. The interlocked steel sheet piling constructed along each corner of the spillway is an SP4 (30.7#) section and is heavily oxidized but in satisfactory condition. The sheeting is slightly bowed in two spots but is very effectively protecting the embankment zones each side of the spillway. The adjacent concrete at the wingwalls is weathered but exhibits only minor surficial cracking and spalling. A 3' x 3' sluicegate is located at the bottom of the center wall and is presently used by the Camp Ranger to annually dewater the lake.

The auxiliary spillway is located near the right abutment and consists of a small, low 3-sided weir (with an effective length of about 9 feet) discharging into 3-18 inch vitrified clay pipes. This spillway is constructed over old timber cribbing and its concrete outfall slab has partially collapsed and is seriously undercut. The ogee spillway drops about seven feet onto a short splash apron. A two foot wide slot for stoplogs is located in the center of the 3 sided weir but is blocked by debris and apparently has not been used recently to control the level of the lake. A brick parapet has been erected on the upstream crest wall and a water intake (for an old pumphouse) is installed immediately to the right of the three

pipes. This facility is not the property of the Boy Scouts. Beyond that a low retaining wall extends along the shoreline protecting the lake front of a private residence situated just beyond the right abutment.

d. Reservoir

Lake Lekau (as it is now called) has stable, wooded natural banks that slope up gradually from the shoreline and are left in a natural state befitting a Boy Scout reservation. Heavy debris appears to have been removed as a continuing part of maintenance. However, nothing has been done regarding the lake's siltation. It was noted that there are two small dams above the study dam (at Duck Pond and Health Lodge Lake). These are also the property of the BSA and are of an insignificant size regarding the hydrologic aspects of the inspection.

e. Downstream Channel

The downstream channel of the North Branch of Big Timber Creek is very irregular and meanders about 1500 feet through a narrow, heavily wooded river gorge before discharging into Pilling lake, whose normal level is about 12 feet below the level of Lake Lekau. The dam at Pilling Lake discharges immediately into the smaller Clementon Lake which is impounded by a gated spillway bridge (Camden County Bridge E8-10). This lake is about 11 feet below Pilling Lake and is situated just south of the business center of the town of Clementon. As stated in paragraph 1.2.d the over-all system of dams places the lower lying business and residential areas of Clementon in a hazardous position should a series of dam collapses occur, especially in view of the inadequate spillway capacity at the Clementon Lake outlet. It was noted, however, that most of the homes long each side of the river channel and lower lakes are well above expected flood elevation.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Operational procedures were not physically observed by the inspection team. Discussions with B.S.A. officials revealed that the camp maintenance crew remove debris from the spillway crests when necessary.

4.2 MAINTENANCE OF DAM

Recently, there has been little major maintenance carried out at the dam except for the removal of debris and dead timber along the upstream slopes. The crest roadway is satisfactorily maintained but is apparently only ocassionally used.

4.3 MAINTENANCE OF OPERATING FACILITIES

No apparent or recent maintenance is in evidence. The 3' x 3' sluice gate which is used to dewater the lake for yearly maintenance was repaired 3 years ago when the wheel and worm gear were removed and a direct lift device was installed.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

At the present time, the camp maintenance crew and Camp Ranger monitor the dam and surrounding area during periods of heavy flow. The reservation is deserted a majority of the winter months. There is no formal warning system in effect.

4.5 EVALUATION

Present procedures indicate that the dam is closely monitored by the Camp Ranger and his maintenance staff who conduct a well-managed operation and are fully aware of their responsibilities. However, a formalized warning system should be established with local Civil Defense and downstream Municipal authorities in view of the hazard potential. In addition, the categorized inspection procedures of the Division of Water Resources are not being annually updated, resulting in a gradual deterioration of the structural condition of the dam. According to records, the dam has not been inspected by a qualified engineer in almost ten years.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

In accordance with the criteria in the Recommended Guidelines for Safety Inspection of Dams, it has been determined that New Camp Site Dam is small in size but placed in the high hazard category. Accordingly, the spillway design flood (SDF) was determined by the inspection team to be one-half the probable maximum flood (PMF). The inflow hydrograph was calculated using precipitation data from Hydrometeorological Report #33.

In accordance with Corps of Engineers directives, the inflow hydrograph and flood routing were performed utilizing the HEC-1 computer program. Peak inflow for the ½ PMF was 3,985 cfs. When routed through the reservoir the peak reduced slightly to 3,961 cfs. The spillway capacity before overtopping occurs is 885 cfs and thus can accommodate only 22% of the design flood.

b. Experience Data

Records indicate that the dam was last overtopped in September 1940. This flood caused a portion of the embankment to be washed out. There were no other records available.

c. Visual Observations

The crest appears to have not been overtopped in recent years and although the spillway has limited capacity, it appears to have proved adequate to accomodate all storms since the 1940 breaching.

d. Overtopping Potential

In view of the hazard classification and present capacity of the spillway (22% of the design flood) the overtopping potential is considerable although according to hearsay information the

dam has not been overtopped since 1940. As indicated on the appended hydraulic analysis, the dam would be overtopped by approximately two feet in the event of the SDF.

e. Drawdown

It would take approximately 12 hours to dewater New Camp Site Lake to an elevation about 8.5' below the spillway crest, utilizing the 3' x 3' sluice gate in the center of the principal spillway.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

The overall alignment and condition of the main spillway is fairly good and appears t be functioning adequately. The addition of the steel sheeting, although installed principally to widen the dam crest, serves to adequately protect the foundation from undermining. The rotted timber decking on the bridge superstructure is of only minor concern due to the lack of traffic and there is little concern that it would fall through the stringers and block the spillway. The irregular embankment appears stable but the downstream slopes contain several deeply scoured areas which would be susceptible to further erosion should the dam be overtopped. From the permeable nature of the underlying sandy soils, it appears there is considerable seepage under the fill but the phreatic line is not revealed on the backslope. As the average height of embankment is about 10 feet, it is believed to have an adequate factor of safety regarding stability. The ogee outlet slab and splash apron of the auxiliary spillway are in an advanced stage of collapse and as nothing is known about the old timber cribbing upon which it is built, its eventual collapse could endanger this zone of the dam. It is noted that the ancient natural channel of the North Branch is located in the vicinity of the main spillway and the auxiliary outlet contributes little to the discharge capacity. Consideration could be given to abandoning this outlet and rebuilding the downstream embankment.

b. Design & Construction Data

The 1946 engineering drawings furnished sufficient data to evaluate the spillway structure and although nothing is known of the embankment, it appears to be well-compacted and in adequate

condition except for the exposed downstream slopes. However, further observations would be required to verify, with any reliability, the source and extent of the seepage observed.

c. Operating Records

No formal operating records exist and the dam has apparently not been inspected within the last ten years. As previously stated, the dam appears to have operated satisfactorily as there are no records of its having been overtopped since 1940 and its embankment has been in place since sometime before 1925.

d. Post Construction Changes

There have been no changes since the existing spillway was installed in 1946 and additionally protected by steel sheet piling some months later.

e. Seismic Stability

The dam appears to have an adequate factor of safety against static loadings and experience indicates that it will therefore have adequate stability against Seismic Zone 1 dynamic loadings. The height of the embankment is so low it will have negligible vulnerability due to earthquake loadings.

SECTION 7 - ASSESSMENTS/RECOMMENDATIONS REMEDIAL MEASURES

7.1 DAM ASSESSMENT

A. Safety

Subject to the inherent limitations of the Phase I visual inspection, the New Camp Site Dam is classified as being in a sound and overall fair condition insofar as its embankment structure is concerned, but the timber spillway bridge carrying vehicular traffic over the main discharge outlet and the auxiliary spillway outfall are in need of repairs. Except for the observed seepage, no seriously detrimental findings were revealed in this inspection to render a questionable judgement as to the structural stability. The overtopping potential is considerable due to the sub-standard spillway crest width and the ease with which the narrow sluiceway openings under the bridge could be blocked with debris. However, there is little that can be done to increase the spillway capacity without undertaking major reconstruction. The dam embankment is built of unknown construction material and seepage was observed behind the spillway and in the middle of the dam. Overtopping could erode the steep unprotected downstream slopes and possibly seriously breach the dam. No detrimental conditions were observed at the spillway to render a structurally inadequate assessment; however, the long-term stability of the auxilary spillway remains extremely questionable until further studies are completed. In summary, the dam is adjudged to be in an overall fair condition.

b. Adequacy of Information

The information gathered for the Phase I inspection is deemed to be adequate for this assessment and regarding the structural stability of the dam except for the lack of detailed information regarding the foundations of the auxiliary spillway. No surveys or

inspections have been recorded since 1970 and the dam has undergone deterioration since that time.

c. Urgency

Further investigation should be undertaken in the near future as a collapse of this dam could irreparably damage downstream residences and businesses and conceivably wash out the dam at Pilling Lake.

d. Necessity for Further Study

Because the structural stability cannot reasonably be ascertained with any reliance, the obtaining of additional information and monitoring of the seepage are recommended. Additional geotechnical investigations should include material property analyses and piezometer readings of the embankment and foundation material. Also, a study should be undertaken regarding the removal or blocking of the auxiliary spillway and the reconstruction of the downstream area.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

It is recommended that further engineering studies be initiated in the near future as the dam is classified in the high hazard category and its spillway hydraulic capacity is inadequate.

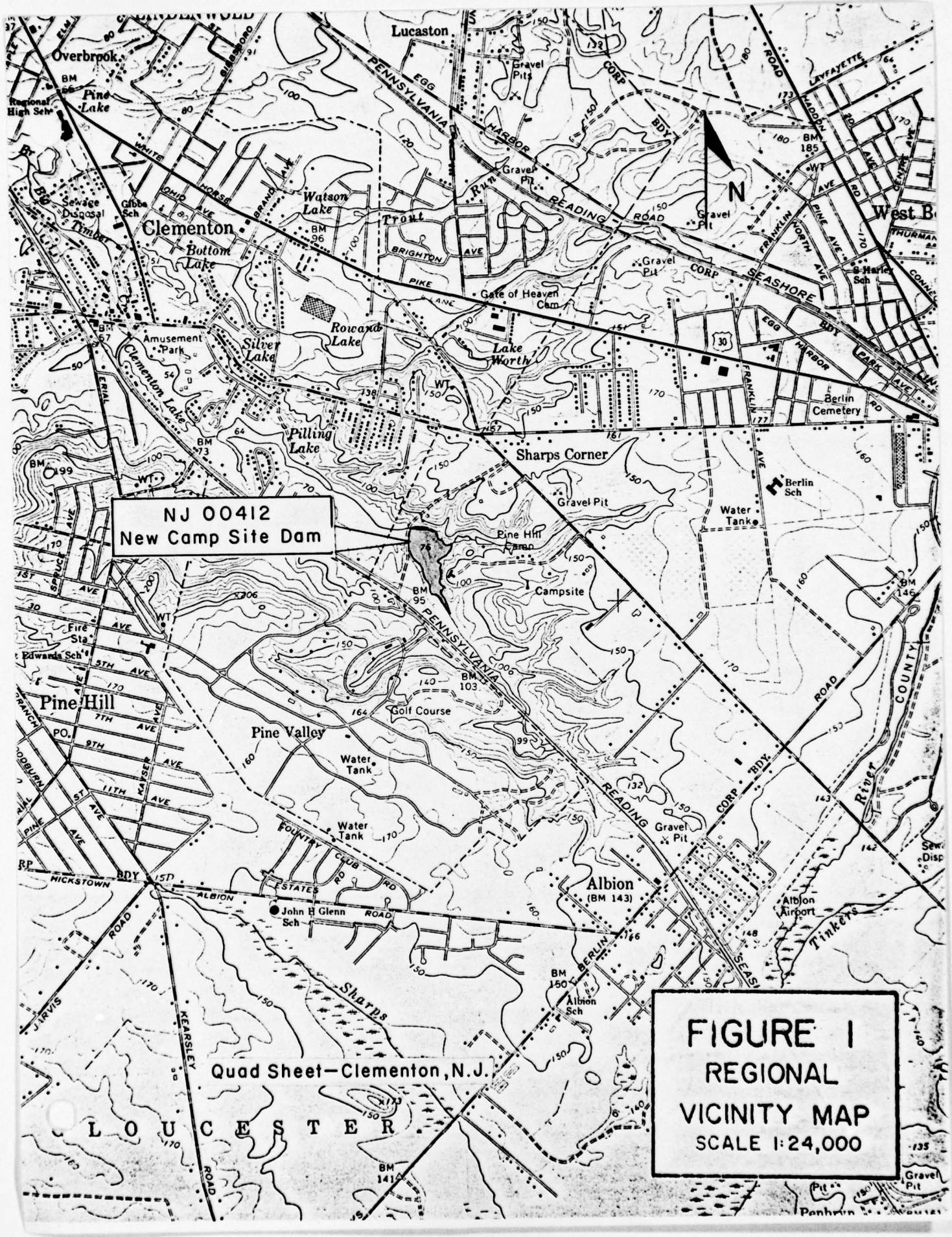
a. Recommendations

- The downstream slopes of the dam embankment in the vicinity of the spillway wingwalls should be regraded, compacted and topped with suitable slope paving.
- The trees should be removed from the downstream slopes and the disturbed and sloughed areas regraded, compacted and seeded.
- The under-cut leaning trees and dead timber along the edge of lake should be removed and the shoreline protected against further undermining.

- The deck plank and railings on the spillway bridge superstructure should be replaced.

b. O&M Maintenance and Procedures

The owners should upgrade O&M procedures by issuing check lists for periodic inspections and institute a system of record keeping for severe storms. Further instruction should be given to the in-house maintenance staff regarding the safety inspection of dams.


NJ 00412
New Camp Site Dam
Quad Sheet—Clementon, N.J.
FIGURE 1
REGIONAL
VICINITY MAP
SCALE 1:24,000
Lucaston
Overbrook
Pine Lake
Clementon
Bottom Lake
Watson Lake
Trout Run
Gravel Pits
Gravel Pit
Gate of Heaven Cem
Amusement Park
Silver Lake
Rowand Lake
Lake Worth
Clementon Lake
Pilling Lake
Sharps Corner
Berlin Cemetery
Berlin Sch
Water Tank
Pine Hill Farm
Campsite
Pine Hill
Pine Valley
Golf Course
Water Tank
Albion
(BM 143)
Albion Airport
John H Glenn Sch
Albion Sch
Edwards Sch
Fire Sta
P.O.
Sharps
Tinkers
Penhorn
PENNSYLVANIA
READING
SEASHORE
CORP
BDY
ROAD
AVE
PIKE
LANE
BRIGHTON
HARBOR
FRANKLIN
WHITE HORSE
BRANCH
RIVER
COUNTY
L O U C E S T E R

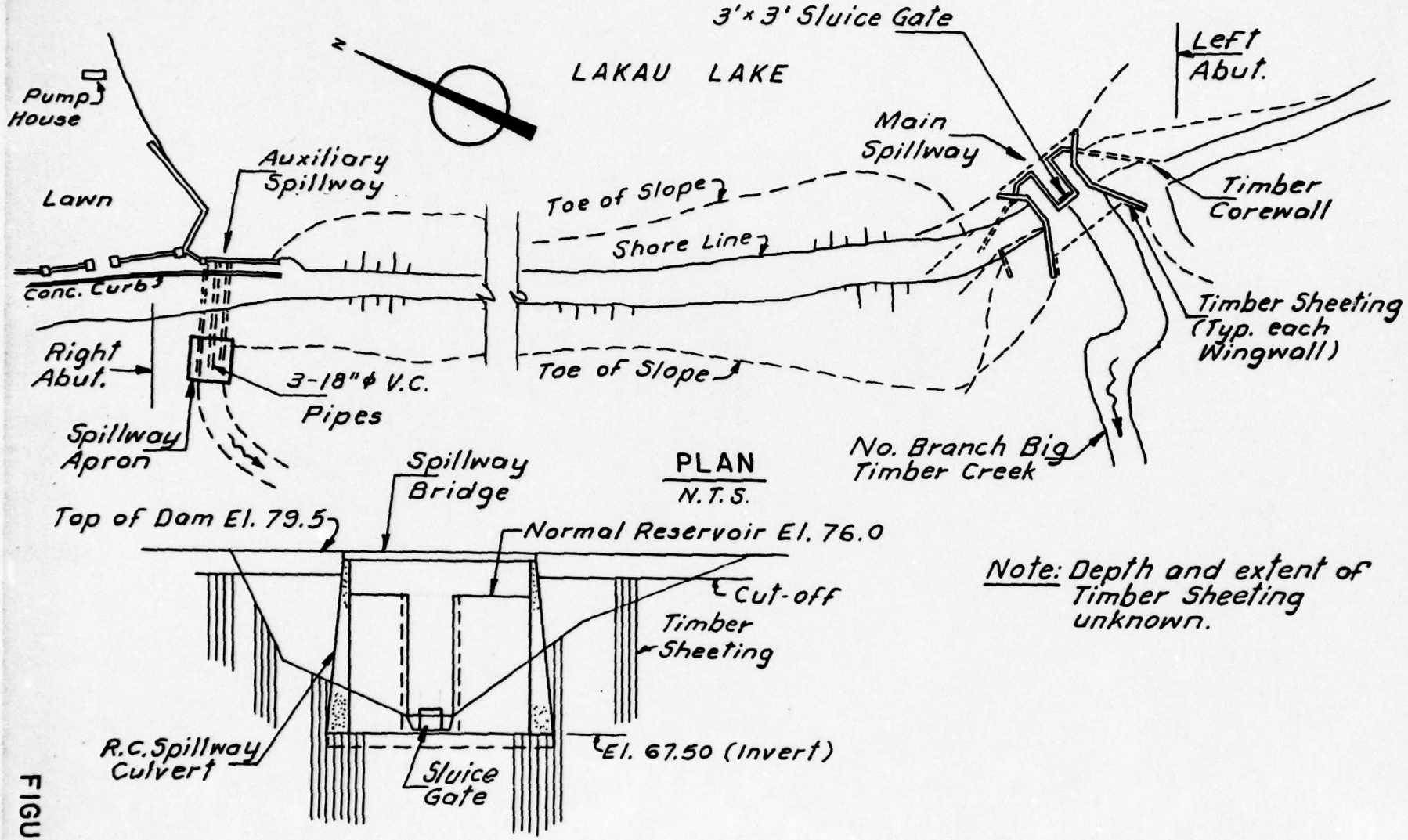

3'x 3' Sluice Gate
LAKAU LAKE
Left Abut.
Pump House
Main Spillway
Auxiliary Spillway
Lawn
Toe of Slope
Timber Corewall
Shore Line
Conc. Curb
Timber Sheeting (Typ. each Wingwall)
Right Abut.
3-18"ϕ V.C. Pipes
Toe of Slope
Spillway Apron
No. Branch Big Timber Creek
PLAN
N.T.S.
Spillway Bridge
Top of Dam El. 79.5
Normal Reservoir El. 76.0
Cut-off
Timber Sheeting
R.C. Spillway Culvert
Sluice Gate
El. 67.50 (Invert)
SECTION THRU SPILLWAY
N.T.S.
Note: Depth and extent of Timber Sheeting unknown.

FIGURE 2

Check List
Visual Inspection
Phase 1

Name Dam New Camp Site County Camden State N.J. Coordinators NJDEP

Date(s) Inspection 1 May 1979 Weather Clear Temperature 60°

Pool Elevation at Time of Inspection 76 M.S.L. Tailwater at Time of Inspection 68 ± M.S.L.

Inspection Personnel:

E. Simone L. Baines

K. Greenfield

K. Jolls

K. Jolls Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
Excessive shrub growth, trees, etc.	Heavy growth on slopes. Many dead trees leaning in all directions	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Satisfactory. Well compacted dirt road on crest.	
ANY NOTICEABLE SEEPAGE	Two major areas of seepage between spillways.	Primary spillway channel parallels toe of slope below dam.
STAFF GAGE AND RECORDER	None	
DRAINS	None	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	5 sided weir - drop inlet under timber superstructure. Crest - good condition.	Superstructure on light steel beams. Deck rotted and in poor condition. 3' x 3' sluice gate at base of center weir wall.
APPROACH CHANNEL	Main lake reservoir	
DISCHARGE CHANNEL	Clogged with fallen timber debris and ill defined.	Natural channel of Big Timber Creek.
BRIDGE AND PIERS	Concrete abutments and spillway walls in satisfactory condition.	No settlement or structural cracking.

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT	3'x3' gate at base of center weir wall.	Closed. Riser gone

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS		
WEIRS		
PIEZOMETERS		
OTHER		

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Flat. Trees extend right down to shorelines.	
SEDIMENTATION	Unknown, but appears to be minor. All slopes wooded and covered with ground cover.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Considerable debris and fallen trees in channel. Channel narrow - 10' to 15' in width.	
SLOPES	Flat, swampy area. Heavily wooded.	
APPROXIMATE NO. OF HOMES AND POPULATION	None in immediate downstream flood plain. Below Pilling dam is the village of Clementon.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

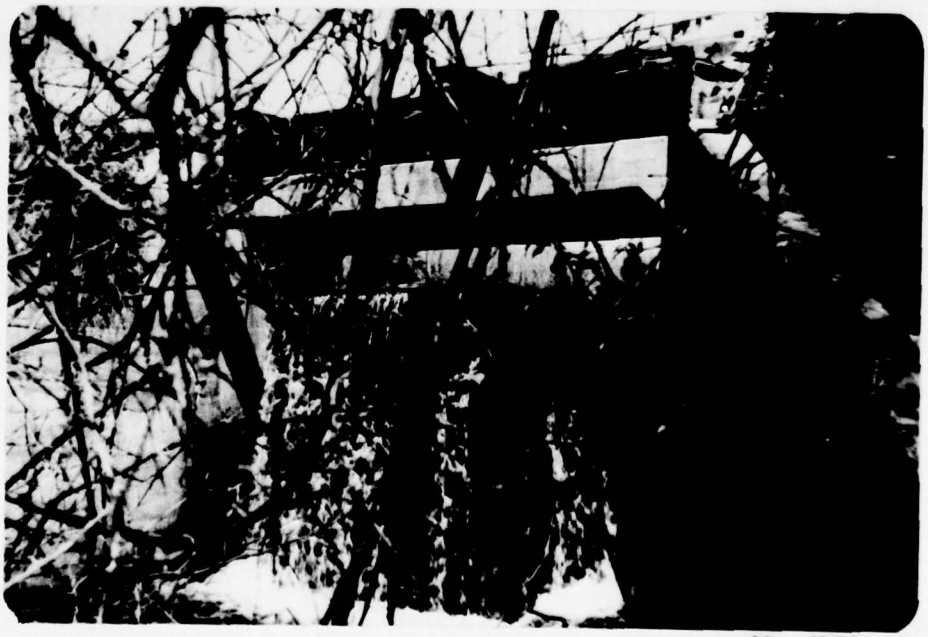
ITEM	REMARKS
PLAN OF DAM	Available from NJDEP
REGIONAL VICINITY MAP	Available; USGS quad sheets
CONSTRUCTION HISTORY	Some known
TYPICAL SECTIONS OF DAM	Available (NJDEP records)
HYDROLOGIC/HYDRAULIC DATA	Some available (Dam Application)
OUTLETS - PLAN	Available (NJDEP)
- DETAILS	Available (NJDEP)
-CONSTRAINTS	None available
-DISCHARGE RATINGS	None available
RAINFALL/RESERVOIR RECORDS	None available

ITEM	REMARKS
SPILLWAY PLAN	Available (NJDEP)
SECTIONS	Available (NJDEP)
DETAILS	Some Available (NJDEP)
OPERATING EQUIPMENT PLANS & DETAILS	Not available

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	None available
DESIGN COMPUTATIONS	None available
HYDROLOGY & HYDRAULICS	None available
DAM STABILITY	None available
SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS	None available
BORING RECORDS	None available
LABORATORY	None available
FIELD	None available
POST-CONSTRUCTION SURVEYS OF DAM	Available (NJDEP)
BORROW SOURCES	Unknown

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Some known (NJDEP records)
HIGH POOL RECORDS	None available
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Available (NJDEP)
MAINTENANCE OPERATION RECORDS	None available

View of Crest May, 1979



View of Primary Spillway Outlet May, 1979

May, 1979

View of Auxiliary Spillway Intake

May, 1979

View of Auxiliary Spillway Outlet

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.9 Sq. mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 76 (74 AF)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 79.5 (131 AF)

ELEVATION MAXIMUM DESIGN POOL: 79.5

ELEVATION TOP DAM: 79.5

CREST:

a. Elevation 79.5
b. Type Earth embankment
c. Width 10' min. varies to 20'
d. Length 370
e. Location Spillover None
f. Number and Type of Gates One vert. lift. C.I. 3' x 3'

OUTLET WORKS: Principal Spillway

a. Type Sharp-crested weir
b. Location Left abut.
c. Entrance inverts 76.0
d. Exit inverts 67.5
e. Emergency draindown facilities See f. above

HYDROMETEOROLOGICAL GAGES: None
a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 885 cfs.

BY D.J.M. DATE 6-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A1 OF

CHKD. BY ____ DATE ____ NEW CAMP SITE DAM PROJECT C234

SUBJECT ____

Time of concentration : (Drainage area = 1.9 Square miles)

length along water course to drainage divide = 1.35 miles
= 7128 ft

$\Delta H = 74'$ $\therefore$ slope $= \frac{74 \times 100}{7128} = 1.04\%$

Assume an average velocity of 2 ft. s^{-1}

$\therefore t_c = \frac{7128}{2 \times 3600} = 0.99$ hours

By California Culverts Method :

$t_c = \left(\frac{11.9 \times 1.35^3}{74}\right)^{0.385} = 0.7$ hours

Use an average t_c of 0.85 hours and increment of 1/4 hour.

$t_p = \frac{0.25}{2} + 0.6 \times 0.85 = 0.64$ hours

$Q_p = \frac{484 \times 1.9}{0.64} \simeq 1437$ cfs

BY D.J.M. DATE 6-79 | **LOUIS BERGER & ASSOCIATES INC.** | SHEET NO. A2 OF

CHKD. BY DATE | NEW CAMP SITE DAM | PROJECT C-234

SUBJECT

Unitgraph :

Time (hours)	T/Tp	Dimensionless Ordinate DO	Q (cfs) = Qp x DO
0.25	0.39	0.268	385
0.50	0.78	0.869	1249
0.75	1.17	0.940	1351
1.00	1.56	0.600	862
1.25	1.95	0.340	489
1.50	2.34	0.197	283
1.75	2.73	0.108	155
2.00	3.13	0.062	89
2.25	3.52	0.035	50
2.50	3.91	0.021	30

Precipitation :

Probable Maximum Precipitation for 200 square miles - 24 hours (in inches) = 23.8"

Maximum 6 hour percentage = 113%

Maximum 12 hour percentage = 123%

Maximum 24 hour percentage = 132%

BY D.J.M. DATE 6-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A3 OF

CHKD. BY ____ DATE ____ NEW CAMP SITE DAM PROJECT C234

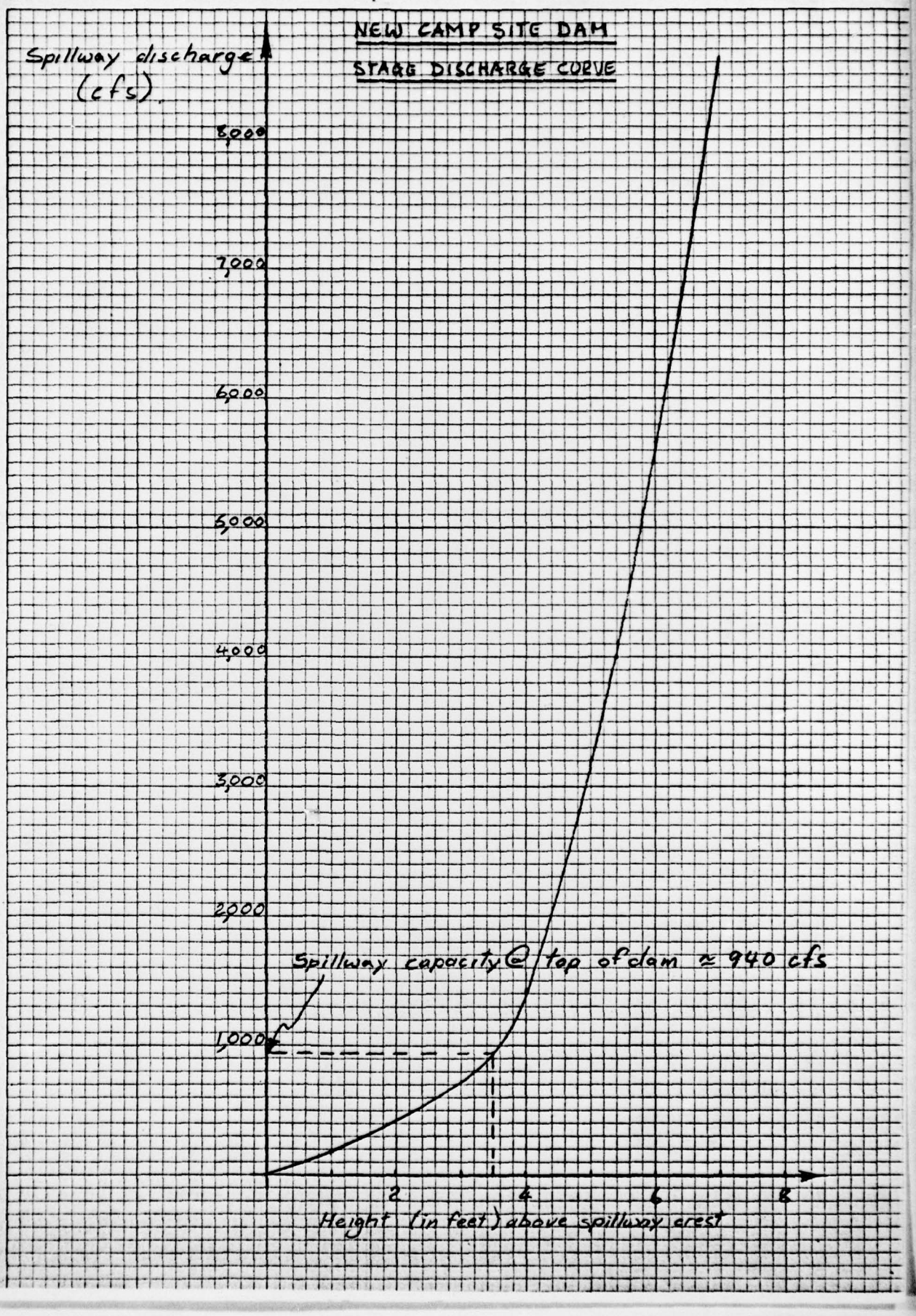
SUBJECT Spillway discharge capacity

Spillway discharge :

flow over main weir L = 42'			flow through 3 18" pipes		flow over dam l = 356'		
H	C	Q	H	Q	H	C	Q
1	3.1	130	3	44			
2	3.1	368	4	51			
3	3.0	655	5	57			
4	3.0	1008	6	62	0.5	2.7	340
5	2.9	1362	7	67	1.5	2.7	1766
6	2.9	1790	8	72	2.5	2.7	3799
7	2.9	2256	9	77	3.5	2.7	6294
8	2.9	2756	10	81	4.5	2.7	9176

ΣQ (cfs)

H	Q
1	174
2	419
3	712
4	1,410
5	3,195
6	5,661
7	8,627
8	12,013



BY D.J.M. DATE 6-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A5 OF

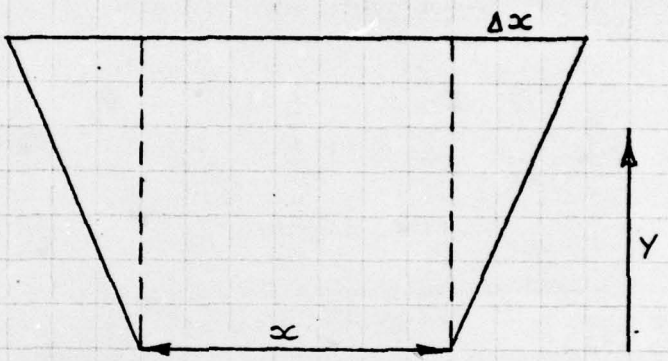
CHKD. BY DATE NEW CAMP SITE DAM PROJECT C-234

SUBJECT

Surcharge storage :

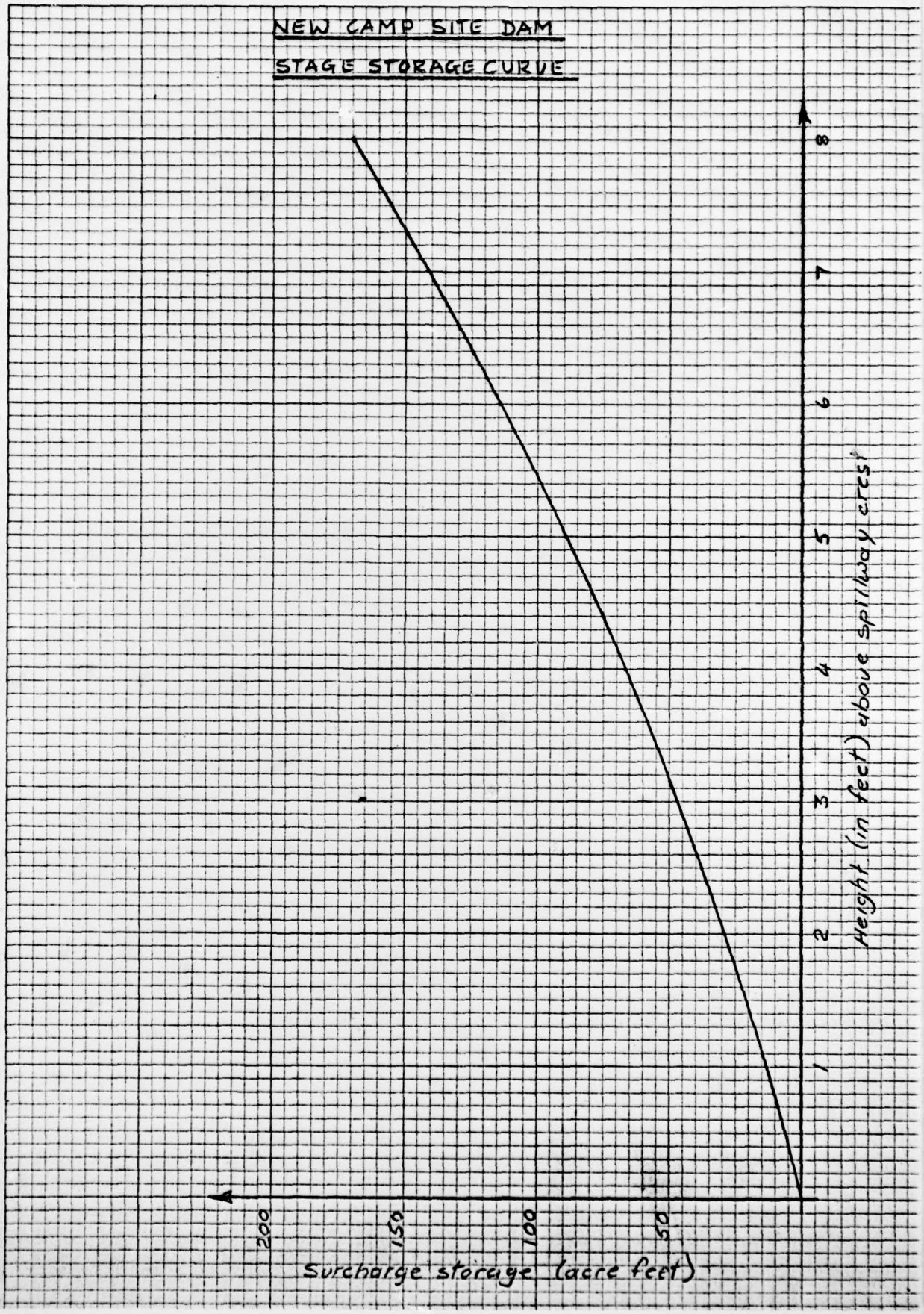
Area of lake @ El. 76 = 12.3 acres @ top of dam = 29.2

Area of 9.0' contour = 44.3 acres



Increment in volume $\Delta V = (x + \Delta x) Y$

Height in feet above spillway crest.	Surcharge storage (acre feet)
0	
1	13
2	29
3	47
4	67
5	89
6	114
7	141
8	170



BY D.J.M. DATE 6-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A7 OF
CHKD. BY DATE NEW CAMP SITE DAM PROJECT C234
SUBJECT

GENERAL SUMMARY OF APPENDIX :

length of dam = 370'
length of spillway @ El. 76 = 42' (effective)

Maximum spillway capacity @ top of dam = 940 cfs

Surcharge storage @ top of dam = 57 acre feet
storage @ normal pool = 174 acre feet

∴ Total storage @ top of dam = 1131 acre feet

lake area @ normal pool = 12.3 acres
lake area @ top of dam = 29.2 acres

drainage area = 1.9 square miles

BY. D. J. M. DATE 7-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A8 OF
CHKD. BY DATE NEW CAMP SITE DAM PROJECT C234
SUBJECT

Available head for drawdown ≐ 8.5'

Storage @ normal pool = 74 acre feet

Assume drawdown in two stages with no inflow and no tailwater conditions.

Stage i)

$H = 6.4'$

$Q = 109$ cfs

$$\therefore \text{time} \doteq \frac{74 \times 43560}{2 \times 109 \times 3600} = 4.11 \text{ hours}$$

Stage ii)

$H = 2.13'$

$Q = 63$ cfs

$$\therefore \text{time} \doteq \frac{74 \times 43560}{2 \times 63 \times 3600} = 7.11 \text{ hours}$$

$$\Sigma \text{ time} = 7.11 + 4.11 = 11.22 \text{ hours}$$

Say 12 hours

NEW CAMP SITE DAM
BY .D.J.M.
JUNE 21 1979

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	15	0	0	0	0	0	0	0

JOPER	NWT
3	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW TO RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	-1	1.90	0.0	1.90	0.0	0.500	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	23.80	113.00	123.00	132.00	0.0	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.732

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.50	0.10	0.0	0.0

GIVEN UNIT GRAPH, NUHGG= 10

385. 1249. 1351. 862. 489. 283. 155. 89. 50. 30.

UNIT GRAPH TOTALS 4943. CFS OR 1.01 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.03	0.00	0.
2	0.03	0.00	0.
3	0.03	0.00	0.
4	0.03	0.00	0.
5	0.03	0.00	0.
6	0.03	0.00	0.
7	0.03	0.00	0.
8	0.03	0.00	0.
9	0.03	0.00	0.
10	0.03	0.00	0.
11	0.03	0.00	0.
12	0.03	0.00	0.
13	0.03	0.00	0.

BY L.J.M. DATE 7-79

CHKD. BY _____ DATE _____

SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

NEW CAMP SITE DAM

SHEET NO. A10 OF

PROJECT C-234

14	0.03	0.00	0.
15	0.03	0.00	0.
16	0.03	0.00	0.
17	0.03	0.00	0.
18	0.03	0.00	0.
19	0.03	0.00	0.
20	0.03	0.00	0.
21	0.03	0.00	2.
22	0.03	0.00	3.
23	0.03	0.00	4.
24	0.03	0.00	5.
25	0.07	0.05	23.
26	0.07	0.05	81.
27	0.07	0.05	144.
28	0.07	0.05	184.
29	0.07	0.05	207.
30	0.07	0.05	220.
31	0.07	0.05	227.
32	0.07	0.05	231.
33	0.07	0.05	234.
34	0.07	0.05	235.
35	0.07	0.05	235.
36	0.07	0.05	235.
37	0.07	0.05	235.
38	0.07	0.05	235.
39	0.07	0.05	235.
40	0.07	0.05	235.
41	0.07	0.05	235.
42	0.07	0.05	235.
43	0.07	0.05	235.
44	0.07	0.05	235.
45	0.07	0.05	235.
46	0.07	0.05	235.
47	0.07	0.05	235.
48	0.07	0.05	235.
49	0.49	0.47	396.
50	0.49	0.47	920.
51	0.49	0.47	1487.
52	0.49	0.47	1848.
53	0.59	0.57	2091.
54	0.59	0.57	2333.
55	0.59	0.57	2530.
56	0.59	0.57	2653.
57	0.74	0.71	2778.
58	0.74	0.71	3003.
59	0.74	0.71	3218.
60	0.74	0.71	3354.
61	1.87	1.84	3866.
62	1.87	1.84	5324.
63	1.87	1.84	6875.
64	1.87	1.84	7863.
65	0.69	0.66	7969.
66	0.69	0.66	6820.
67	0.69	0.66	5400.
68	0.69	0.66	4483.
69	0.54	0.52	3906.
70	0.54	0.52	3421.
71	0.54	0.52	3039.
72	0.54	0.52	2807.
73	0.04	0.01	2483.
74	0.04	0.01	1779.

75	0.04	0.01	1078.
76	0.04	0.01	632.
77	0.04	0.01	379.
78	0.04	0.01	233.
79	0.04	0.01	155.
80	0.04	0.01	110.
81	0.04	0.01	85.
82	0.04	0.01	70.
83	0.04	0.01	70.
84	0.04	0.01	70.
85	0.04	0.01	70.
86	0.04	0.01	70.
87	0.04	0.01	70.
88	0.04	0.01	70.
89	0.04	0.01	70.
90	0.04	0.01	70.
91	0.04	0.01	70.
92	0.04	0.01	70.
93	0.04	0.01	70.
94	0.04	0.01	70.
95	0.04	0.01	70.
96	0.04	0.01	70.
97	0.0	0.0	65.
98	0.0	0.0	47.
99	0.0	0.0	28.
100	0.0	0.0	16.
SUM	23.04	20.52	101614.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7969.	3805.	1058.	1016.	101612.
INCHES		18.63	20.73	20.73	20.73
AC-FT		1898.	2100.	2100.	2100.

RUNOFF MULTIPLIED BY 0.50

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	2.	2.	2.	11.	41.	72.	92.	103.	110.
114.	116.	117.	118.	118.	118.	118.	118.	118.	116.
118.	118.	118.	118.	118.	118.	118.	118.	198.	460.
743.	924.	1045.	1166.	1265.	1326.	1389.	1502.	1609.	1677.
1933.	2662.	3438.	3932.	3985.	3410.	2700.	2242.	1953.	1711.
1520.	1403.	1241.	869.	539.	316.	190.	116.	77.	55.
47.	35.	35.	35.	35.	35.	35.	35.	35.	35.
35.	35.	35.	35.	35.	35.	32.	23.	14.	8.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3985.	1903.	529.	508.	50807.
INCHES		9.32	10.36	10.36	10.36
AC-FT		944.	1050.	1050.	1050.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTING THROUGH RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
11	1	0	0	0	0	1

ROUTING DATA

GLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	0.

BY D.J.M. DATE 7-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A12 OF
CHKD. BY ______ DATE ______ NEW CAMP SITE DAM PROJECT C-234
SUBJECT ______

450 SQUARE 4 X 4 TO THE INCH

STORAGE=	0.	13.	29.	47.	67.	89.	114.	141.	170.	0.
OUTFLOW=	0.	174.	419.	712.	1410.	3195.	5661.	8627.	12013.	0.

TIME	EOP STOR	AVG IN	EOP OUT
1	0.	0.	0.
2	0.	0.	0.
3	0.	0.	0.
4	0.	0.	0.
5	0.	0.	0.
6	0.	0.	0.
7	0.	0.	0.
8	0.	0.	0.
9	0.	0.	0.
10	0.	0.	0.
11	0.	0.	0.
12	0.	0.	0.
13	0.	0.	0.
14	0.	0.	0.
15	0.	0.	0.
16	0.	0.	0.
17	0.	0.	0.
18	0.	0.	0.
19	0.	0.	0.
20	0.	0.	0.
21	0.	0.	0.
22	0.	1.	0.
23	0.	2.	1.
24	0.	2.	1.
25	0.	7.	3.
26	1.	26.	8.
27	1.	56.	20.
28	3.	82.	35.
29	4.	98.	50.
30	5.	107.	64.
31	6.	112.	76.
32	6.	115.	85.
33	7.	116.	93.
34	7.	117.	99.
35	8.	118.	103.
36	8.	118.	107.
37	8.	118.	109.
38	8.	118.	111.
39	8.	118.	113.
40	9.	118.	114.
41	9.	118.	115.
42	9.	118.	115.
43	9.	118.	116.
44	9.	118.	116.
45	9.	118.	117.
46	9.	118.	117.
47	9.	118.	117.
48	9.	118.	117.
49	9.	158.	127.
50	13.	329.	176.
51	21.	602.	293.

Printed in U.S.A.

BY D.J.M. DATE 7-79

CHKD. BY _____ DATE _____

SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

NEW CAMP SITE DAM

SHEET NO. A13 OF

PROJECT 6-234

52	30.	834.	442.
53	40.	985.	598.
54	49.	1106.	771.
55	55.	1216.	1007.
56	60.	1296.	1160.
57	63.	1358.	1265.
58	66.	1445.	1360.
59	68.	1555.	1502.
60	70.	1643.	1630.
61	72.	1805.	1790.
62	77.	2298.	2253.
63	86.	3050.	2980.
64	94.	3685.	3668.
65	97.	3958.	3961.
66	94.	3697.	3695.
67	87.	3055.	3063.
68	81.	2471.	2523.
69	76.	2097.	2135.
70	73.	1832.	1858.
71	70.	1615.	1637.
72	66.	1462.	1477.
73	66.	1322.	1367.
74	61.	1065.	1207.
75	54.	714.	946.
76	46.	427.	690.
77	38.	253.	564.
78	31.	153.	446.
79	24.	97.	349.
80	19.	66.	272.
81	15.	49.	211.
82	12.	39.	165.
83	10.	35.	133.
84	8.	35.	110.
85	7.	35.	91.
86	6.	35.	78.
87	5.	35.	67.
88	4.	35.	59.
89	4.	35.	54.
90	4.	35.	49.
91	3.	35.	46.
92	3.	35.	43.
93	3.	35.	41.
94	3.	35.	40.
95	3.	35.	39.
96	3.	35.	38.
97	3.	34.	37.
98	3.	28.	35.
99	2.	19.	31.
100	2.	11.	26.
SUM			50722.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3961.	1856.	528.	507.	50722.
INCHES		5.09	10.35	10.35	10.35
AC-FT		921.	1049.	1049.	1049.

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RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	3965.	1903.	529.	508.	1.90
ROUTED TO	11	3961.	1856.	528.	507.	1.90